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Variability of ethics education in laboratory medicine training programs: Results of an international survey



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ABSTRACT

Background: Ethical considerations are increasingly important in medicine. We aimed to determine the mode and extent of teaching of ethics in training programs in clinical chemistry and laboratory medicine.

Methods: We developed an on-line survey of teaching in areas of ethics relevant to laboratory medicine. Responses were invited from directors of training programs who were recruited via email to leaders of national organizations.

Results: The survey was completed by 80 directors from 24 countries who directed 113 programs. The largest numbers of respondents directed postdoctoral training of scientists (42%) or physicians (33%), post-masters degree programs (33%), and PhD programs (29%). Most programs (82%) were 2 years or longer in duration. Formal training was offered in research ethics by 39%, medical ethics by 31%, professional ethics by 24% and business ethics by 9%. The number of reported hours of formal training varied widely, e.g., from 0 to >15 h/year for research ethics and from 0 to >15 h for medical ethics. Ethics training was required and/or tested in 75% of programs that offered training. A majority (54%) of respondents reported plans to add or enhance training in ethics; many indicated a desire for online resources related to ethics, especially resources with self-assessment tools.

Conclusion: Formal teaching of ethics is absent from many training programs in clinical chemistry and laboratory medicine, with heterogeneity in the extent and methods of ethics training among the programs that provide the training. A perceived need exists for online training tools, especially tools with self-assessment components.

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1. Introduction

As in other areas of medicine and science, ethical questions are present in laboratory medicine [1–3]. These ethical questions have increased in complexity with the advent of genetic testing, biobanking, direct-to-consumer testing, and genomic testing, among other newer areas of diagnostic testing [4–7]. Laboratory medicine practitioners deal with issues of patient confidentiality on a daily basis, as well as issues of research ethics (including publication ethics), professional ethics (such as financial conflicts of interest) and business ethics (such as

intellectual property and human resource management). Despite the need for practitioners to answer the questions in these areas, little is known about the teaching of ethics in laboratory medicine training programs.

PubMed searches for “ethics education pathology” and “ethics education laboratory medicine” returned 195 and 151 results, respectively. Few of the returned papers were relevant to the teaching of ethics in laboratory medicine [2,8,9]. One paper called for increased teaching of ethics in pathology residencies [8] and one indicated a need for increased teaching of ethics in training programs in clinical chemistry and laboratory medicine [2]. Only one paper, from 2002, described an attempt to gain information about the then-current teaching of ethics. In that study, chairs of U.S. pathology departments were asked about the training of pathology residents in the U.S. [9]. Formal ethics training was provided by 62% of the programs and 84% of respondents believed

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that ethical issues were under-recognized. In the present study, we aimed to obtain international information about current and planned teaching of ethics specifically in doctoral and postdoctoral training programs that are designed to train directors of clinical chemistry and laboratory medicine.

2. Methods

This study used an online survey of teaching of ethical issues by training programs in clinical chemistry and laboratory medicine. A questionnaire with 43 questions was designed to obtain (A) general information about each surveyed training program (such as the requirements for prior education of applicants to the program) and (B) specific information on various aspects of ethics education, such as the presence or absence of teaching about specific areas of ethics relevant to clinical chemistry and laboratory medicine, and (C) plans for future teaching. (The questionnaire is available in Supplement 1).

The survey was web based in the Survey Monkey format (www.surveymonkey.com). The questions were predominantly of multiple choice with an opportunity to add additional information. To keep the survey brief, detailed questions about teaching in a specific area of ethics (such as business ethics or professional ethics) were not displayed if the respondent indicated that no training was provided in that area.

The target groups were training programs for doctoral scientists or physicians or persons with similar backgrounds engaged in comprehensive training programs to prepare trainees to be directors of large or medium-sized laboratories in clinical chemistry and laboratory medicine. Recruitment was via 2 emails sent from the office of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) to the national representatives of the 89 member societies of IFCC; each of the member societies represent clinical chemists in its country, and each represented country has only one member society of IFCC. The emails were prepared by the authors of this paper in their capacity as members of the IFCC Task Force on Ethics. The emails requested that national representatives invite directors of appropriate training programs in their countries to complete the questionnaire at the survey website. In an effort to increase visibility of the request to training program directors, copies of the emails were sent to the presidents of the national societies. The respondents were invited to provide contact information if they wanted a report on the results of the survey, but the survey was otherwise anonymous.

Responding program directors completed the questionnaire online between December 2, 2013 and June 13, 2014. We downloaded the responses from Survey Monkey and analyzed them further in Excel. No effort was made to link the identities of the respondents to their individual responses to the questions in the survey. The contact information was queried to provide an indication of the diversity of countries from which responses had been received.

3. Results

3.1. Characteristics of training programs of survey respondents

The survey was completed by 80 training-program directors. The largest numbers directed postdoctoral training of scientists (42%) or physicians (33%); post-masters degree programs (33%); and/or PhD programs (29%). The 59 survey respondents who identified themselves were from 24 countries (Table 1A).

As shown in Table 1B, 82% of the programs were accredited by an outside organization. The largest number, 27, was accredited by the Commission on Accreditation in Clinical Chemistry (ComACC). This number of responses approaches the number of programs accredited by ComACC, but may be an overestimate of the response rate as more than one co-director of a program may have completed the survey.

Table 1

Countries (A) and accrediting organizations (B) of training programs directed by survey respondents.

A. Countries of respondents who identified themselves*		
Albania	Indonesia	Poland
Argentina	Italy	Serbia
Australia [2]	Japan	Slovak Republic
Canada [8]	Lithuania	The Netherlands
Croatia	Malaysia	Tunisia
Finland	Morocco	Turkey [4]
Iceland	Nepal	United States (14)
India [12]	Paraguay	Uruguay
B. Accrediting organizations		Number (%)
Commission on Accreditation in Clinical Chemistry (North America)		27 (36%)
Canadian Academy of Clinical Biochemistry		8 (11%)
Accreditation Council for Graduate Medical Education		6 (8%)
Royal College, not otherwise specified		3 (4%)
Other		18 (24%)
None or no response		18 (18%)

* The numbers are minimum estimates as not all respondents identified themselves. The number of respondents who identified themselves from each country is indicated in parentheses if greater than one.

For 82% of the programs, the length of training was 2 years or longer. Forty-six percent of programs produced 1, 2, or 3 trainees per year, although 12 (16%) graduated more than 10. The most common number of graduates per year was one.

As an indication of where the graduates of the programs start their careers after completing their training programs, the respondents were asked to indicate the preferences of trainees for employment. University hospital employment was the clear first choice, followed, in distant second and third places, by research institutions and academic departments and then government and non-university hospital employment and industry employment, respectively.

3.2. Teaching of ethics in training programs

3.2.1. Overview

As shown in Table 2A, 35% of the respondents indicated that formal training was provided in research ethics, although only 24% of programs indicated that training in research ethics was *required*. Fewer programs offered training in medical ethics (29%), professional ethics (20%) and business ethics (8%), with only 21%, 16% and 4%, respectively, requiring training in each of these latter 3 areas. Only three programs provided and required training in ethics in all 4 areas. The teaching of business ethics was so infrequent that it will not be dealt with further here.

Results for programs providing training in selected areas of ethics for different types of training programs are shown in Table 2B. Training of ethics was less commonly offered in postdoctoral programs compared to the other three training levels. Interestingly, training in medical ethics appeared to be less likely to be provided in postdoctoral programs for scientists (22%) than in postmedical programs (40%).

3.2.2. Research ethics

The topics that were most frequently listed as taught in the 25 programs that provide training in research ethics are listed in Table 3A. Most of these critical topics, such as the Helsinki Declaration and protection of participants, were included in over 80% of programs that had formal training in research ethics.

For approximately half of these programs, the time allotted to lectures/seminars on research ethics was 1–6 h (Table 3B). In approximately two-thirds of the programs, the teaching of ethics was done by an interdisciplinary team that included an ethicist. Just over 60% indicated that teaching of research ethics was incorporated in other teaching. Almost 90% of this group indicated that students' knowledge

Table 2

Training in selected areas of ethics as reported by all 80 surveyed programs (A) and according to type of program (B).

A. Topics taught	Training Is offered (% of programs)	Training Is required (% of programs)		
Research ethics	28 (35%)	19 (24%)		
Medical ethics	23 (29%)	17 (21%)		
Professional ethics	16 (20%)	13 (16%)		
Business ethics	6 (8%)	3 (4%)		
Any of four ethics categories	36 (45%)	26 (32%)		
All four ethics categories	3 (3.8%)	3 (3.8%)		
B. Topics taught according to type of program				
Number and % of programs that teach each area*				
Topic	Training after a masters degree (25)	Doctoral science degree is awarded (22)	Postdoctoral training of scientists (32)	Postmedical training (25)
Research ethics	11 (44%)	10 (45%)	10 (31%)	11 (44%)
Medical ethics	9 (36%)	11 (50%)	7 (22%)	10 (40%)
Professional ethics	6 (24%)	5 (23%)	5 (16%)	7 (28%)
Business ethics	1 (4%)	2 (9%)	7 (28%)	3 (12%)

* The 80 surveyed directors led the 104 programs above and 9 additional programs that did not fit into any of the 4 categories represented in this table.

of research ethics was tested, most commonly (74%) by multiple-choice examinations.

3.2.3. Medical ethics

The topics that were most frequently listed as covered in the 22 programs that provided training in medical ethics are shown in Table 4. Not surprisingly, the most common topic was principles of medical ethics, included in 20 (91%) of these 22 programs as a topic. Specific topics, such as patient privacy (77%), were less commonly included. Surprisingly, the concept of equipoise, which provides the ethical basis for medical research that involves assigning patients to different treatment arms of a clinical trial, was covered by only 2 programs perhaps reflecting the paucity of randomized controlled trials in laboratory medicine.

Medical ethics was taught in lectures (11 programs), seminars (8 programs), online (7 programs) and other ways (6 programs). Thirteen (59%) of the 22 respondents indicated that teaching of medical ethics was incorporated in other teaching either along with or in place of formal allocation of time. For approximately three quarters of these programs, the time allotted to lectures/seminars on medical ethics was between 1 and 6 h. Training was most often provided by an interdisciplinary team that included an ethicist.

Students' knowledge of medical ethics was tested in 18 (82%) of these programs, most often by multiple choice tests (78%) and oral tests (44%).

Table 3

Most-frequently covered topics in research ethics (A) and time devoted to teaching of research ethics in 25 training programs that offer formal training in research ethics.

A. Topics covered	Covered by number (and %) of programs
Responsibility of investigators	23 (92%)
Protection of participants	22 (88%)
Helsinki Declaration	21 (84%)
Publication ethics	21 (84%)
Biobanking	12 (48%)
B. Time devoted to teaching of research ethics	
Number of teaching hours	Number (%) of programs
1–3	9 (35%)
4–6	5 (19%)
7–9	5 (19%)
10–12	3 (12%)
More than 13	4 (15%)

3.2.4. Professional ethics

The topics that were most frequently listed as covered in the 15 programs that provided training in professional ethics were codes of practice (codes of conduct) in all 15 programs, conflicts of interest (13 programs, 87%), and duties to society (10 programs, 67%). The number of hours of lectures/seminars on professional ethics was 1–3 h for 10 programs, but 4 programs indicated 7–9 h. Teaching was done by an interdisciplinary team that included an ethicist (10 programs) and by an instructor in a field other than ethics (5 programs). In 10 programs, teaching of professional ethics was incorporated in teaching of other topics. Only 9 programs indicated that trainees' knowledge of professional ethics was tested.

3.3. Planned changes in teaching of ethics

When asked if changes in teaching of ethics were planned, 34 of 63 responding directors (54%) indicated that changes were planned. Among 17 free-text responses were comments about (1) a new module being developed on a specific topic in ethics, (2) planned annual sessions on ethics, (3) a workshop on laboratory ethics for professionals, (4) self-learning opportunities, (5) the use of case studies in small-group teaching, and (6) creation of a national commission. Two respondents specifically mentioned business ethics as an area for attention.

The survey invited the directors to rate the potential usefulness of possible new tools in their programs. The 63 directors who responded ranked on-line resources that included self-assessment as the most-useful tools, followed by on-line tools generally. Ethics sessions for trainees at national meetings ranked third, with books and monographs far behind.

4. Discussion

This is the first international study of the teaching of ethics in educational programs in laboratory medicine and the largest survey of

Table 4

Most-frequently covered topics in teaching sessions in 22 training programs that offer formal training in medical ethics.

Topic	Covered by number (and %) of programs
Principles of medical ethics	20 (91%)
Patient privacy	17 (77%)
Ethical decision-making	13 (59%)

teaching of ethics in laboratory medicine or pathology. The survey results indicate that (1) training in medical, research, professional and business ethics was absent from a sizeable majority of the respondents' training programs, (2) about half of the responding program directors plan to add or enhance ethics training and (3) there is a desire for on-line resources to aid in ethics training in laboratory medicine.

The results reported above can be compared to some extent with the results of a survey of teaching of ethics in U.S. pathology residency programs [9]. That survey, published in 2002, was directed to chairmen of U.S. pathology departments, among whom 36% (53/148) responded. Among the 45 chairmen who responded to a question about the presence or absence of formal training in ethics, 28 (62%) indicated that formal training was provided, a proportion that seems large compared with the data in the present study. The chairmen reported a mean (range) duration of formal instruction in ethics per year of 3.8 (0.75–18) hours in those programs that offered training. In the present study, approximately half (46%) of programs that offered training in research ethics devoted 7 or more hours to the topic (Table 3b); smaller additional blocks of time were devoted to other areas of ethics. The topics of most interest in the survey of pathology chairmen were issues related to (1) the use of tissue for research, (2) confidentiality and privacy, and (3) professionalism. These topics overlap considerably with the topics covered by training programs in the present survey.

In the present survey, the methods for teaching of ethics varied considerably among programs, with lectures and seminars appearing to be popular and with textbooks ranking low. The respondents' low rating of books and monographs as tools may reflect lack of interest in learning from books or may reflect the fact that books on ethics relevant to laboratory medicine already exist and there is no need for new ones. The latter possibility seems unlikely as we have not been able to find a book with its focus specifically on ethics and laboratory medicine, and coverage of ethical topics in general textbooks of clinical chemistry and laboratory medicine tends not to be extensive. For example, the most-recent editions of two textbooks in clinical chemistry [10,11] include brief descriptions of topics in ethics in their short first chapters, but the coverage is not adequate to form a basis for a formal series of lectures or seminars. One textbook in molecular diagnostics contains a section on ethics in each chapter [12]. Whether these sections are useful or even used is unknown. The present study cannot address the fundamental question of which, if any, of the pedagogical techniques used in the surveyed programs is likely to be successful in affecting behavior in a positive way [13]. This is potentially a fertile area for future investigation.

Strengths of the current study include its international scope, the reasonably large number of responses, the high agreement on some measures among the respondents (such as the very low rates of teaching of business ethics), and, in the case of ComACC-approved programs, an apparently high response rate.

The study has several weaknesses. The generalizability of the results is unknown as the proportion of all training programs that responded is unknown. The response rate for ComACC-accredited programs (mostly in the U.S.) appeared to be high. By contrast, the response rate world-wide is unknown as there is no international directory of training

programs. A high response rate does not appear to have been achieved world-wide, as suggested by the absence of respondents who identified themselves as being from numerous populous countries such as Brazil, China, Egypt, Russia, Saudi Arabia and the United Kingdom, although 21 respondents did not identify themselves and some of them may have been from countries not listed in Table 1A. Caution should be used in any attempt to generalize the findings to a specific country or region. An additional limitation is the possibility of bias in self-selection of respondents. Directors with an interest in ethics may have been more inclined to respond to a survey on ethics. If so, the reported rates of teaching of ethics may be overestimates, and the teaching of ethics may be even more limited than the survey results suggest.

In summary, the teaching of ethics appears to be highly variable among training programs in laboratory medicine. The reasons for this variability warrant study. As with heterogeneity in other activities in medicine, variability suggests opportunities for improvement.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.cca.2014.11.023>.

References

- [1] McQueen MJ. Ethics and laboratory medicine. *Clin Chem* 1990;36:1404–7.
- [2] Bruns DE. Improving training in laboratory medicine. *Clin Chim Acta* 2008;393:3–4.
- [3] Burnett L, McQueen MJ, Jonsson JJ, Torricelli F. IFCC position paper: report of the IFCC taskforce on ethics: introduction and framework. *Clin Chem Lab Med* 2007;45:1098–104.
- [4] McQueen MJ. Some ethical and design challenges of screening programs and screening tests. *Clin Chim Acta* 2002;315:41–8 [Review].
- [5] McQueen MJ. Ethical and legal issues in the procurement, storage and use of DNA. *Clin Chem Lab Med* 1998;36:545–9 [Review].
- [6] McQueen MJ. The ethics and economics of out-of-laboratory testing. *CMAJ* 1993;149:1653–6.
- [7] McQueen MJ. Conflicting rights of patients and health care workers exposed to blood-borne infection. *CMAJ* 1992;147:299–302.
- [8] Rosenblum MK. Examination of professional and ethical issues in the fellowship application process in pathology. *Hum Pathol* 2008;39:1552–3.
- [9] Domen RE. Ethical and professional issues in pathology: a survey of current issues and educational efforts. *Hum Pathol* 2002;33:779–82.
- [10] Burtis CA, Ashwood EA, Bruns DE. Tietz textbook of clinical chemistry and molecular diagnostics. 5th ed. St. Louis: Saunders/Elsevier; 2012.
- [11] Burtis CA, Bruns DE. Tietz fundamentals of clinical chemistry. 7th ed. St. Louis: Saunders/Elsevier; 2015.
- [12] Bruns DE, Ashwood ER, Burtis CA. Fundamentals of molecular diagnostics. St. Louis: Saunders/Elsevier; 2007.
- [13] McCormack WT, Garvan CW. Team-based learning instruction for responsible conduct of research positively impacts ethical decision-making. *Account Res* 2014;21:34–49.